

WHITMAN COLLEGE
DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE

CS 327
ALGORITHM DESIGN AND ANALYSIS

Spring 2018

Instructor

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Office hours: You can walk in any time my door is open, or email to make a specific appointment. Official office hours are 2-4pm Mondays and Fridays

Course Overview and Purpose

Algorithms, the well-defined procedures for solving computational problems, are central to all of computer science. Every piece of useful software or hardware implements an algorithm. While programmers and mathematicians use algorithms every day, this course seeks to provide a rigorous framework that we can use to answer questions about algorithms. How can we prove that an algorithm is correct? How can we prove that an algorithm is efficient? Additionally, we will review powerful algorithms that have wide-ranging applications to studying graphs, text processing, biology, cryptography, and many others. We will also become familiar with introductory complexity analysis, the area of algorithm analysis that attempt to classify problems based on how difficult they are to solve. From this, we can learn to recognize difficult problems, and know when *not* to try to find a provably correct and efficient algorithm to solve a problem where such an algorithm does not exist.

Course Learning Objectives

By the conclusion of the course, you will be able to:

- Apply asymptotic runtime complexity analysis to algorithms
- Rigorously prove that an algorithm is correct and efficient
- Apply advanced algorithms to problems in a variety of domains
- Classify problems according to the complexity classes P and NP

Textbook

Algorithms by Dasgupta, Papadimitriou and Vazirani

Lectures

Tuesdays and Thursdays, 1:00-2:20pm, in Olin 124

Prerequisites

Math 126, CS 220 or Math 260, CS 270

Credit

3.0 Credit hours

ASSIGNMENTS, EXAMINATIONS, AND GRADING

Homework and Programming Assignments

We will have approximately weekly homework assignments, which you will complete in groups. Occasionally, we have an applied programming assignment to practice implementing some of the algorithms we discuss in class in place of a homework assignment. Your lowest homework score during the semester will be dropped.

Homework will typically be completed in prearranged groups. Each week, your grade on the homework assignment will be based on three factors:

Homework problem review	5 points
Group written solution	10 points
Individual oral homework presentation	10 points

Homework problem reviews are due Thursdays at 8pm. They will not be graded for correctness, and are meant to encourage strong preparation for group work. Problem reviews should describe your understanding of at least one of the homework problems, and some progress towards a potential solution idea or strategy.

Homework groups will have scheduled times to meet with me on Monday afternoons. Each group will have a 30 minute time, at which the group submits a joint written solution to the homework for discussion and feedback.

During the meeting, individual members of the group will be randomly assigned part of the homework to explain orally. Oral explanations will be evaluated based on demonstrated understanding of the problem and solution given, including responses to questions.

The combination of group work and individual explanations is meant to encourage each student to learn as much as possible. Additionally, oral discussions of technical material can be excellent preparation for senior exams, interviews, and many other contexts.

Late Submissions

Late submissions for assignments will not be accepted without prior arrangement. Recall that your lowest homework score will be dropped.

Examinations

There will be a take-home midterm exam and a cumulative take-home final exam.

Course Grading	Course Points
Homework and Programming Assignments	70%
Participation and Readbacks	5%
Midterm exam	10%
Final exam	15%

Your letter grade will be assigned based on the “standard” 90% As, 80% Bs, 70% Cs, 60% Ds cutoffs. These cutoffs may be lowered, but will not be raised. I would be happy to see every student earn an A.